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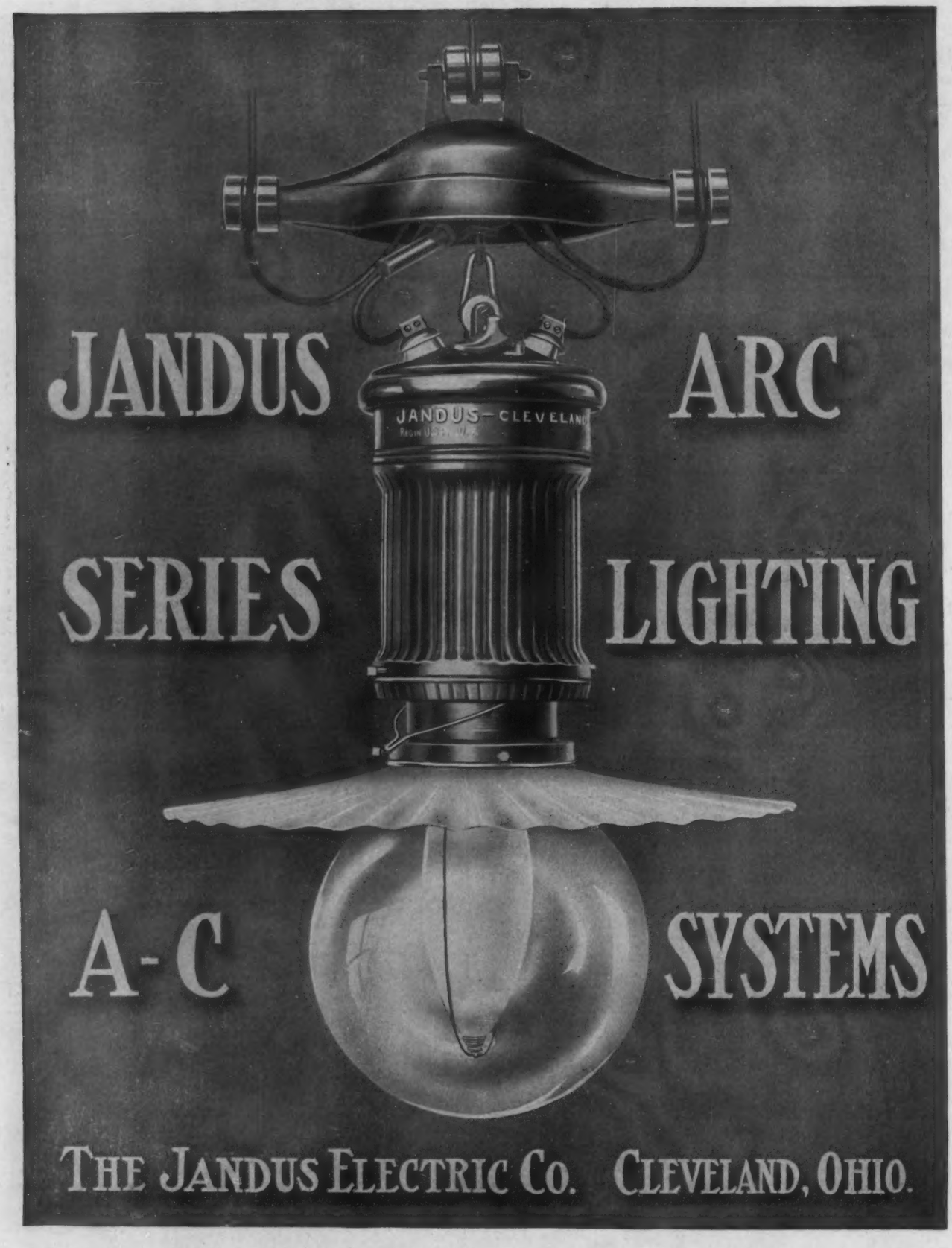

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MODERN GAS ENGINE DEVELOPMENT IN EUROPE AND AMERICA.

During the past decade there has been no form of machinery which has made greater strides either in this country or in Europe than the high-power, internal-combustion engine. This form of prime mover, together with the steam turbine, is making great inroads into the field of the reciprocating steam engine.

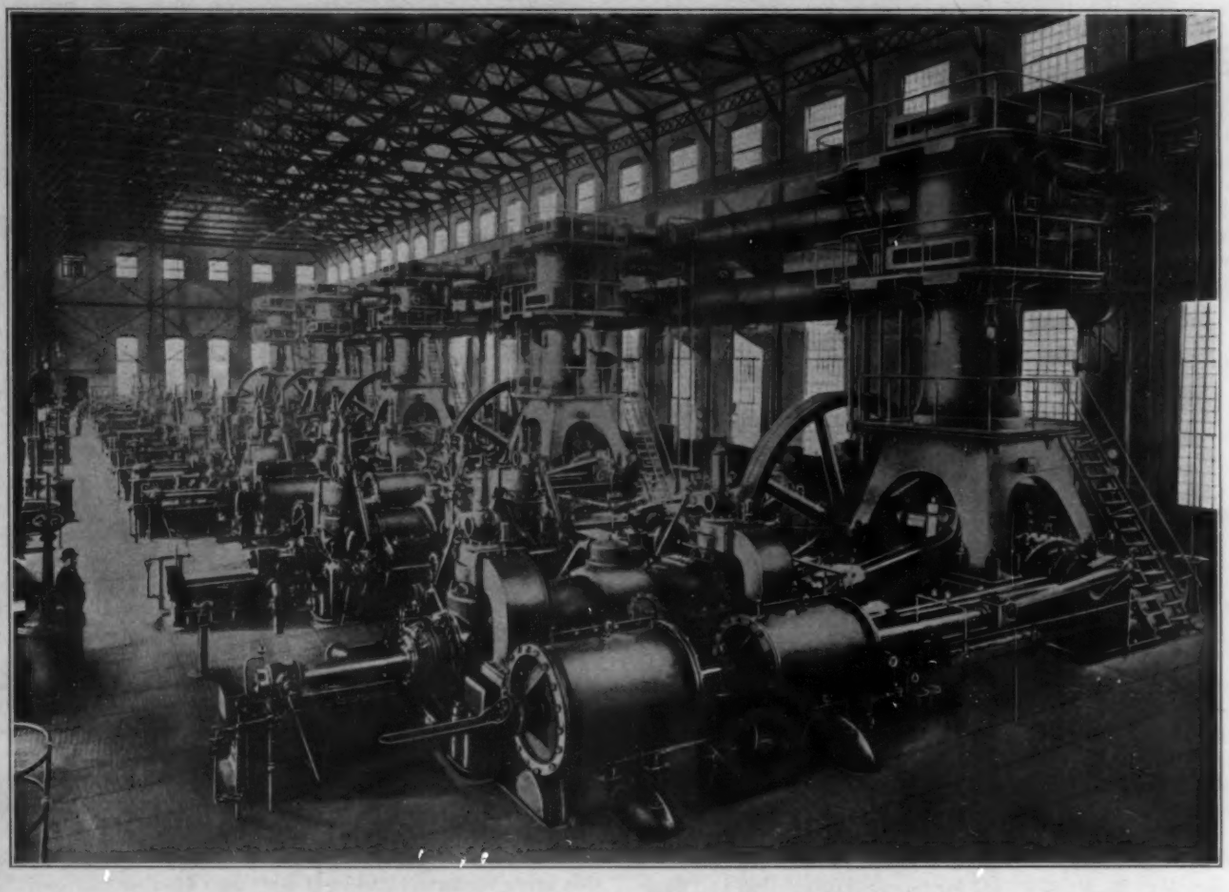


FIG. 1. 2000 H. P. KOERTING BLOWING GAS ENGINES AT BUFFALO STEEL PLANT.

From a financial point of view it may be safely stated that during the coming decade even greater results will be attained, not only effecting wonderful economy to the user of the high-power gas engine, but also to the manufacturer of this unique type of prime mover in the United States as well as abroad.

The gas engine was developed very largely in Germany, first for power purposes, operating machinery through main shafting and belt and rope transmission. The 100-horsepower unit at the Kollrepp Werkes in Meissen is operated from a suction gas producer. The single-acting engine of this type was one of the first to be developed, and it is generally acknowledged that Germany is to be credited for the first rapid introduction of direct-connected gas engine and electric generator sets, and the use of gas engines in central stations of small and moderate size.

The demand for gas engines of larger size and better regulation resulted in the coupling of two or more cylinders in tandem and twin tandem construction, and also mounting four cylinders of the single-acting type on a common sub-base or foundation and direct-connecting the four cylinders to the revolving field shaft of the electric generator. Large iron and steel plants recognized the advantages of gas engines driven by waste blast-furnace gases, but higher power units were necessary.

A six-hundred-horsepower Deutz engine in the central

power station of the Gutehoffnungshutte at Oberhausen is directly coupled to a 3,000-volt Drehstrom alternator. This engine is of the four-cylinder type, single-acting, and operates at a speed of 150 revolutions per minute.

Some of the earliest work in gas engines was done in Germany, and that country has not been behind in developing the modern high-power gas engine and the up-to-date gas producer. The double-acting engines and the high-power single-acting engines have reached almost a perfected state, through the efforts of German engineers, and the two-cycle, as well as the four-cycle engine, has been utilized extensively in German power plants, for iron and steel plants, street railways, and electric central stations for distribution of light and power service.

The earlier gas-engine control stations were equipped with comparatively high-speed dynamos operated by gas engines of small size, by belt transmission. Such a plant was installed at St. Gall in 1897, using 30-horsepower, 100-horsepower and 150-horsepower units. The electrical generators are three-phase alternators and direct-current machines, used for lighting and railway power service.

The next advancement in gas-engine construction and operation with electrical generators, was the direct coupling of the engine and the dynamo on the same shaft, which necessitated the use of slower-speed electrical machines. A central station of small engine units of 100 horsepower and 125 horsepower, installed in 1890, or somewhat earlier, directly coupled to direct-current generators, large flywheels being used to aid in the regulation of the speed and the steadiness of the lights.

Within the last few years the subject of utilizing the waste blast-furnace gases has been carefully studied, and prominent Belgian and German engineers began to design internal-combustion engines suited for using this waste fuel. Many difficulties had to be overcome with the increase of size of these engines, and the dust in the blast-furnace gas was found to give more or less trouble. An English engineer, Mr. B. H. Thwaite, associated with Frank L. Gardner, worked out a system of cleaning and purifying these gases as they come from the coke ovens and blast furnaces, so they can better be utilized for operating high-power gas engines.

Several 200-horsepower and 300-horsepower gas engines drive alternators at the power house of the Oberschles. Eisenbahn-Bedarfs-Actien-Gesellschaft Friedenhutte, near Morgenroth. Very heavy flywheels are used, and two engines are coupled to one alternator, to increase the capacity and aid in regulation. The two engines, first installed in 1898, gave a total output of 400 horsepower, and operated at a speed of 160 revolutions per minute. The dynamos were of the three-phase type, the last two engines, installed in 1899, giving a total output of 600 horsepower, and operated at a speed of 167 revolutions per minute.

In double-acting gas engines explosions occur at both ends of the cylinder and thus giving almost as good regulation as the steam engine, especially when two cylinders are connected in tandem or twin. By constructing these large units as twin-tandem gas engines very high power may be obtained, 2,000 to 8,000 horsepower being developed by the largest sizes designed.

In iron and steel plants the high-power gas engine operating from waste blast-furnace gases is not only used for generating electrical current for power transmission and lighting service, but it is also employed for supplying the air blast, large air cylinders being directly connected to 500-horsepower, 1,000-horsepower, and even 2,000-horsepower gas engines for this purpose. They are also used extensively for operating large pumping plants, as a great deal of water is used in and about every large iron and steel works. Among the principal types of foreign gas engines now in operation in large sizes, should be mentioned the Oechelhauser and Koerting two-cycle engines; also the Nurnberg, Cockerill, and Soest four-cycle engines, nearly all of which are now constructed in large units as double-acting machines.

One of the most interesting and successful types of two-cycle gas engines in operation abroad to-day is the Oechelhauser motor, operated by waste blast-furnace gases for driving blowing cylinders and for direct connection to electrical generators. A 500-horsepower, single-cylinder engine of this type is working as a blower engine at the Borsigwerk in Oberschlesien, Germany. These engines have two plunger pistons working toward each other in a single cylinder, which is open at both ends. The pistons of this engine, before reaching their dead points, open successively their different ports, the exhaust port first, then the port for rinsing the clyinder with fresh air and finally the gas inlet port.

The Oechelhauser blowing engine, with the working cylinder 30.5 inches in diameter and a stroke of 37⅜ inches, has a maximum output of 800 I. H. P. The blowing cylinder being 72½ inches in diameter and the speed 100 revolutions per minute, it is estimated that the engine is capable of compressing 17,662 cubic feet of air per minute to a pressure of 7.7 pounds per square inch. The working of the engine is regulated in a similar manner to that of a steam engine, by a gas admission valve, and it may be governed as to speed within limits of 50 to 100 revolutions per minute, and may therefore be suited within a wide range to the different stages of working of the iron furnaces. A 1,000-horsepower engine of this type has been constructed for driving an alternator in the power house of the Borsig works, and three of the same-size engines are used for the same purpose at the electric station of the Sudrussiche Metallurgische Gesellschaft, in Kamenskoje, Russia, the current being utilized for supplying lights about the plant, and for operating numerous electric motors of various sizes.

The cylinder of this engine has no valve operating during the piston stroke, and it is, therefore, of simple construction, which is of great value on account of the conditions met with in working with furnace waste gases. The air and gas are supplied by a feed pump attached to the engine, and they are compressed in the receivers arranged around the inlet ports to such an extent that there is effected sufficient rinsing of the cylinder, as well as a thorough mixing of the air and fresh gas.

Directly after the ignition of the explosive mixture, a large quantity of the burned gases escapes, reducing the pressure in the working cylinders to as low as the atmosphere and then the entering fresh air blows out the rest of these gases through the exhaust pipe. In this way a yielding cushion is formed between the hot gases and the fresh ones before the fresh supply of gas enters and mixes with the air forming the explosive mixture. These gases are then compressed, and ignition takes place just before the end of the compression. This drives the pistons apart, and the cycle is renewed and continues indefinitely.

The speed is regulated by a simple admission valve, which governs the gas supply to the pump. The ignition is produced by electricity, and an electric motor is used to turn the engine into the starting position.

Compressed air is used to start the engine, an electric pump storing the air into a proper receiver. The working cylinder is fastened in the cooling mantle in such a manner as to allow free expanding by the heat, the cooling spaces also being brought close to the receivers for air and gas.

There are no piston rods and packing boxes to the explosion chamber as long as the cylinder is open at both ends, the two pistons being connected by one front and two side rods to a three-throw crank shaft. The double-acting pump for charging is worked in tandem to the rear piston crosshead. This flushes the working cylinder with a current of cold air, as mentioned above, in advance of the following charge of air and gas for combustion. The two-cycle engines are particularly well adapted for driving three-phase alternators in parallel, on account of the close governing and the

fact that explosions occur at every revolution. It is stated that with two-cycle engines the flywheels are not required to be as large, for the above reason. Double-acting engines are now being constructed with great success, both on the two-cycle and four-cycle systems, and the capacities have been increased until now tandem and double-tandem engines are being built of 3,000 horsepower, and double-acting gas engines for use with waste blast-furnace gases have been designed for 6,000 horsepower. The field of the high-power gas engine is growing rapidly, and they are receiving much attention, both in this country and in Europe, especially in connection with power plants of large iron and steel works.

As noted in illustrations, Figs. 1 and 2, of the power plants of the Lackawanna Steel Plant at Buffalo, there are a number of large Koerting engines in service. The illustration, Fig. 1, shows five of the sixteen blowing engines of 2,000 horsepower each, and there are eight other units, as noted in Fig. 2, in the electric power station, which are in operation, driving direct and alternating-current generators of 1,000 horsepower each. This engine is double-acting, and has a water-cooled gland for the piston rod, while the gas and air are compressed by separate cylinders. The gas and air are admitted by mushroom valves to the working cylinder, and exhaust ports are provided at the middle of the cylinder. These ports exhaust at each end of the long piston as it travels back and forth.

The inlet valve is opened as the pressure falls by exhaust, and the remainder of the exhaust charge is driven out by the fresh charge until the middle exhaust ports are covered by the piston as it returns. The fresh charge is compressed and fired after the inlet has been closed.

An explosion occurs at each revolution alternately at each end of the working piston, working similarly to a steam engine, and the admission valves are located in valve boxes which are bolted to the cylinder heads. It will be noted that no exhaust valves are necessary, as the products of combustion escape through the slots in the middle of the cylinder. As these slots are covered by the motor piston itself, it is made long, and is packed at each end with self-closing spring rings.

The mixed gases are admitted through two double-acting auxiliary pumps, one of which is used for gas, and the other for air compression, and they are proportioned so that a proper mixture of air and gas is introduced at the proper time into the working cylinders.

The Lackawanna Power House No. 1, noted in Fig. 2, is equipped with eight twin Koerting, two-cycle, double-acting gas engines, each having a capacity of 1,000 horsepower, directly coupled to alternating and direct-current generators. Three of these twin engines are direct-connected to 500-kilowatt, direct-connected Sprague-Lundell generators, supplying a current of 250 volts pressure, operating at a speed of 100 revolutions per minute.

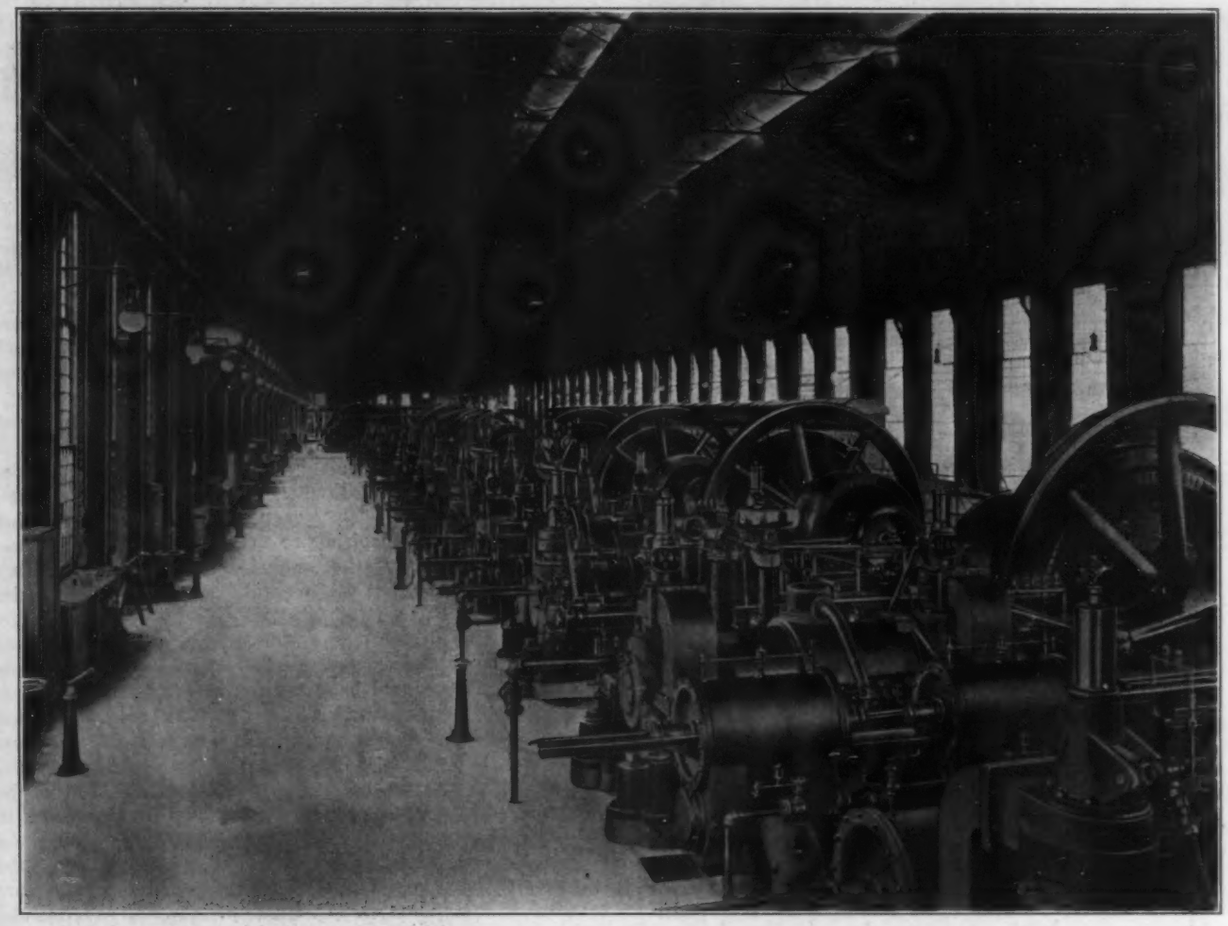


FIG. 2. EIGHT 1000 H. P. KOERTING ENGINES AT LACKAWANA STEEL PLANT.

The remaining five 1,000-horsepower Koerting engines are direct connected to three-phase alternating-current generators, each having an output of 500 kilowatts. These machines supply polyphase current at 440 volts, and a frequency of 25 cycles per second, and were constructed at Schenectady, N. Y., by the General Electric Company.

The power house is 730 feet long, and an immense pipe is installed along one-half of its entire length, supplying the engines with waste blast-furnace gases; the gas engines occupying about 340 feet of the south half of the building.

The remaining half of power house No. 1 is equipped with a Porter-Allen 1,000-horsepower engine and generator, a number of motor-driven Brush arc machines, and several

exciter dynamos installed across the building, together with four Ingersoll-Sergeant air compressors, with several larger compressors of the Dickson and Southwark types.

A large number of high-pressure pumps are also installed in the north end of power house No. 1, together with other auxiliary apparatus and accumulators to keep the pressure at 450 pounds.

Fig. 1 shows the first five gas-blowing engines installed in the other power house of the Lackawanna Steel Company, which will ultimately contain sixteen engines of this type, of 2,000 horsepower each, making a total of 32,000 horsepower for this one power house, and a complete gas-engine plant of 40,000 horsepower capacity.

These 2,000-horsepower, twin Koerting gas engines in operation in this plant, each driving a vertical 76-inch by 60-inch blowing cylinder, at a speed of 70 to 80 revolutions per minute. All of the above engines are operated with blast-furnace gas. The blast-furnace gas supplied to these engines has a heat value of 80 B. T. U. per cubic foot, and consume only about 10,000 B. T. U. per brake horsepower per hour, which corresponds to a heat efficiency of 25.5 per cent, based on the brake horsepower. As will be seen in the accompanying illustration, these engines are of the vertical-horizontal type, the air cylinder being arranged as a vertical element and the gas-engine cylinders as the horizontal element. The gas engines are of the twin Koerting double-acting type.

Although of German design, the engines are constructed in this country by the American representative, the De La Vergne Machine Company, of New York. The air cylinders are six feet four inches in diameter, with a stroke of five feet, while the Koerting gas-engine power cylinders measure 38.5 inches in diameter, with a stroke of 60 inches. The air-pump cylinders of the Koerting gas engine are 38.25 inches in diameter, while the gas-pump cylinders of the engines are 45.25 inches in diameter.

The eight direct-current and alternating-current generators of 8,000-horsepower capacity, in power house No. 1, operated by double-acting gas engines, supply current through a large switchboard extending along the south end of the building, this current being employed for operating hundreds of motors throughout the steel plant and in the yards, which are several miles in length. Electric motors are used for the unloading devices at the ship canal, and also on the traveling cranes and hoists to the blast furnaces, electric locomotives to the Bessemer steel plant, and the rolling mill where live rolls and various saws, rail straighteners and other tools are electrically driven. This great power plant will also supply current for operating the new rolling mill, for plates and structural steel, and also the electric charging machines for the Siemens-Martin open-hearth plant, and the cranes used for handling and stripping the ingots from the moulds.

The air and gas and power cylinders and the compression spaces of the pump on the Koerting engine are divided so that the crank ends of the air-pump and gas-pump discharge into the crank end of the power cylinder. It will also be noted that the head end of the power cylinder is supplied with air and gas from the head ends of the pumps.

It is stated that only a moderate pressure is required to start the engine, as the pressure is always less than that of the compressed charge. The weight of the flywheels is much less than the single-acting machines, as there is an impulse every stroke. The thermal efficiency of the Koerting gas engine has been experimentally determined by Prof. E. Meyer to be thirty-eight per cent for this two-cycle engine. The lubrication of the gas engine is an important item of expense, and high-grade oil is necessary for the best result. The 500-horsepower engine at Duisburg required, during twenty-four hours, eight and two-thirds kilograms of cylinder oil and six kilograms of machine oil, while the blowing cylinder on the same engine required three kilograms of oil, according to C. Canaris and H. Fellinger, of the Rheinische Bergbau und Hüttenwesen Actien Gesellschaft. Two electric sparkers are provided at each end of the power cylinder, for the ignition of the explosive charge, and these are separated by a separate shaft driven by spur gearing from the cam shaft. The time of ignition can be changed during the running of the engine to suit whatever kind of gas is being used at the time. The engine is started by compressed air, under a pressure of 150 pounds when driving a blowing cylinder, and with about 100 pounds for engines without blowing cylinders, a piston valve being provided as front and back ends of the cylinder for admitting the compressed air as one would admit steam to a steam engine.

This type of engine is particularly well adapted to the driving of alternating-current electrical generators in parallel. The use of the gas engine of large power with electrical generators is rapidly coming into extensive use, and a wide field is opening up for this form of motive power, using natural gas as a fuel, as well as the waste gases from blast furnaces.

COPPER MARKET SITUATION.

All developments in the copper market recently have certainly been in the customer's favor, and no important sales are being made. The irregularity in quotations is a most unfortunate thing for producer and consumer alike, and market stability is impossible so long as sellers continue this irregularity in an absolutely dull situation. Such a proceeding can only work confusion in the trade and is exceedingly detrimental to manufacturers conducting a legitimate business. There is an unfortunate condition which would seem to be created more or less by speculators and those who are known as manipulators, which lends credence to the theory that quotations are often made with a view to their influence on Wall Street and the hope of securing financial gains by conspiring to create an unhealthy condition, either by over-inflation or undue depreciation of values, as the case may be, but the general result upon business interests is very bad.

When the demand was unusually good, copper was rushed up to tweny-six and one-half cents per pound, when the wiser policy would have been never to have allowed it to go above twenty cents. The precipitate haste in advancing prices met with some efforts to counteract this action, but more shortsighted interests were unable to resist the temptation to exact the big premiums obtainable from the needy consumer, and, even at top prices, it was hard to obtain a full supply, except for distant future. After the tension of last year has become a thing of the past, the trade conditions are coming down to a normal and more healthy basis. The whole situation is perplexed by the action of an erratic copper market, and consumers, for their own safety, are compelled to adopt a waiting policy.

What the manufacturer and buyer need, is the assurance that they can safely buy copper for two or three months' deliveries, and not be left in the lurch before thirty days have passed, by a radical decline in the market value of their raw material. Conditions in manufacturing lines are fairly active, and such as to warrant the maintenance of a reasonably firm copper market, provided the unnatural means for depressing it cease. The present rate of consumption is less than that last year, but the pace ten or twelve months ago was very much too fast to continue, and the country was attempting more than it could reasonable finance. Now current business is sufficiently good to keep up a steady demand upon the mills of the country at a fairly encouraging level, and with the proper readjustment of the copper market to existing conditions trade should open up hopefully in the Fall.

Conservatism should be the watchword of the consumer, and a "hand to mouth" policy followed until our unfortunate financial problems are solved and the market for raw copper on a stable and solid basis.—"Copper Gossip."

NATIONAL IRRIGATION CONGRESS.

The National Irrigation Congress, held at Sacramento, California, during the past week, has discussed matters of such vital import to hydro-electric engineering on the Pacific Coast that we publish an account of the opening day's program, to be followed in our next issue by some of the papers of interest to our readers.

The congress, with 2000 delegates present, was opened Monday afternoon with the "Irrigation Ode," rendered by the 200 members of the Ogden Tabernacle choir.

Mayor M. R. Beard of Sacramento then delivered the address of welcome on behalf of the city and was followed by Governor James N. Gillett, of California, who welcomed the delegates to the State.

Governor George Chamberlain, of Oregon, president of the congress, responded in behalf of the congress.

After paying a glowing tribute to the enterprise and hospitality of Californians, Governor Chamberlain said in part:

"The Federal Government has under consideration and construction projects of reclamation in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington and Wyoming, covering more than three million acres, much of which is in private ownership and the balance owned by the States and the United States. The work entails the expenditure of vast sums, but the money involved is a mere bagatelle in comparison with the benefits received and to be received in providing homes for thousands and adding millions to the wealth of the nation.

"Unfortunately, just at a time when these projects were progressing nicely, Justice Brewer of the Supreme Court of the United States, in the case of Kansas vs. Colorado, 27 Supreme Court Reports 655, intimated a doubt as to the constitutionality of the reclamation act in so far as it attempted to authorize the National Government to exercise control or jurisdiction in the matter of the reclamation of semi-arid lands within the boundaries of the several States, though he expressly conceded that the National Government has power to dispose of and make all needful rules and regulations respecting lands owned by the United States within the borders of the States. The intimation of the Court was not necessary to the decision of the cause, it seems to me, and ought not to be cited as a precedent for interference with projects already under way or in contemplation. However that may be, the decision is unfortunate, for litigation at suit of private persons and corporations is already resulting therefrom where projects of the Government have attempted to supplant or interfere with those initiated by such persons or corporations. The questions involved, I trust, will be discussed at this congress and some means suggested to meet and obviate the objections raised by the learned Judge. The proper and speedy determination of the matter is essential to the successful consummation of the great reclamation projects now under way.

"In addition to the work now being done under Governmental supervision, contracts have been entered into with private contractors for reclamation of large tracts of land in all the States which have accepted the provisions of the Carey act. Some of these are making favorable progress. My experience has been, however, that whilst the Government moves slowly, the work done by it is more substantial and in the end better, and more lasting results are likely to be attained."

Fairbanks' Speech.

Vice-President Fairbanks was given an enthusiastic reception when he arose to deliver his address. He spoke as follows:

"The effect of irrigation in this Western country can be appreciated only by those who are familiar with it from personal observation. The change made in the conversion of an arid waste into fruitful fields seems almost incredible. There is no more radical transformation to be found anywhere than in the parched valleys and plains which have been irrigated, and which prior thereto produced nothing but sage brush. The most unproductive land has become the most fertile. From the worst, it takes rank as the best. It is hard to find anywhere more apparently unproductive land than that which is occupied by sage brush, and no more bountiful harvests are gathered than those which this same forbidding land produces when touched by the vitalizing influence of irrigation. There are promising fields today where there was no sign of habitation before we entered upon the present reclamation policy, and what is being done is but prophetic of what we shall accomplish if we faithfully adhere to the policy upon which we have entered and carry it out to the limits of its possibilities.

"We have long since passed the experimental stage, and it only remains to push the work wherever feasible with the utmost vigor. The reclamation of every ten or twenty acres of land means the creation of a homestead which will comfortably support a family of industrious, intelligent and patriotic American citizens.

"The development of irrigation by the National Government must have a profound and far-reaching influence upon the general subject of irrigation throughout the country. It will tend powerfully to the extension of irrigation into portions of the country which have hitherto relied largely upon rainfall in the cultivation and growing of crops. There is no more important subject for the consideration of farmers in many of the humid and semi-humid regions than that of so-called supplemental irrigation. We must prepare more and more for the increased demand upon our food supply which comes with the multiplying millions of our population. Therefore, the development of the subject of irrigation is of interest, not only to the farmers of these great Western regions but to farmers and consumers everywhere.

"We do a substantial and permanent service to our country by enlarging the area unto which men and women may come from the congested centers and find occupation for their energies and homes for their heads. Let a man own a piece of ground which he may cultivate, put him into partnership with nature and it will intensify his love of country and make him a more stable, conservative and patriotic citizen. Increase the home builders and the home owners of the Republic and you augment its real abiding strength.

"The development of the reclamation service in this Western country means the increase of migration hither of many desirable citizens. It will come here and avail itself of the opportunities which are to be found in this vast region where nature's bounties afford an ample and inviting field. It is in our interest that more of them should come into the Pacific States and aid you in the great work of building up your agriculture and your trade and in creating here a splendid, progressive civilization.

Reckless Forest Policy.

"Closely related to the subject of irrigation is the work of forestry preservation. The two subjects go hand in hand. We have pursued a somewhat reckless policy with regard to the forests of the United States. In some sections of the country—in fact, in almost every section—we have denuded our lands of timber in what now seems to have been almost a wanton fashion. We have thought only of to-day, having no proper regard for the future. The demand of the country for timber needed to build our railways, construct our cities and homes has been tremendous. We have cut away our forests and paid no attention to the necessity of taking steps for their ultimate restoration. We now see that some of the older countries in their experience have seen that it is necessary to adhere to a rational, scientific forestry system, not only in the interest of our future forests, but in the interest of the important subjects of irrigation and naviga-

tion. It is but a truism that if the forests are swept away the rainfall quickly flows into the streams and is wasted into the sea, whereas if the trees are properly preserved upon the watersheds the rainfall and melted snows are stored in nature's reservoirs and are gradually fed into the streams for the benefit of both agriculture and navigation.

"We have not fairly begun to appreciate the full value of our streams and rivers. We have not fairly begun to appropriate them to the benefit of our agriculture, industry and commerce. The waters which come down from the sides of these mountains may be converted into electrical power and carried hundreds of miles with but little loss to the initial energy and appropriated to lighting and heating cities, operating mines and driving the wheels of industry. We have thousands of miles of rivers which may be made navigable with little expense to the Government, compared with the benefits flowing from their use in carrying commerce. There are thousands of miles of rivers which are navigable in a degree, but which should be deepened and improved so as to meet our growing needs. It is impossible to give too much emphasis to the importance of this subject. Our rivers are the natural highways of commerce, and the growing density of our population and the increase of our production make it essential that there should be additional facilities to insure cheap and ready transportation. The capacity of the railways of the country is already taxed to the utmost, and the rapid development of traffic makes it necessary that we should largely augment the means of carrying it in the future. Moreover, there is no better equalizer of rates than water competition. Water transportation is a perpetual and certain guaranty against monopoly on the part of common carriers.

"We are earnestly carrying forward the construction of the Panama canal, confessedly a work of great importance, not only to our commerce but to the commerce of the world. Important as this matter is, it is not more important than the improvement of navigation upon many of our rivers. The improvement of navigation upon them may well go hand in hand with work upon the great canal. The one is in a very considerable degree the complement of the other. This is a large subject and must be considered in a large way.

"Upon such an occasion as this I would not venture to obtrude politics—nothing could be more inappropriate. The fact is that we have a surfeit of politics. What we need most is more business and less politics. Unless the business affairs of the people are arrested by unwise policies; unless the seeds of distrust are sown among ourselves; unless commercial unrest is encouraged by doctrinaires, we shall continue to expand our industries, and the great West will continue to grow and fulfill her mighty destiny. Can we stand prosperity? We are in the midst of a prosperity the like of which was never before seen. Can we utilize it to our benefit? Can we retain it, or will we distrust each other and involve it all in hopeless confusion? There never was an hour when it was more important that we should be governed by sober judgment. We should sedulously cultivate a tolerant spirit and a spirit of justice toward each other. We should not forget that confidence is the sure foundation of prosperity and progress, and we should have a care that we do not undermine it."

At the conclusion of Mr. Fairbanks' address Gifford Pinchot, Government Forester and personal representative of President Roosevelt at the congress, delivered the message of the country's chief executive, which came by telegraph.

President Roosevelt's Greetings.

To the Officers and Members of the National Irrigation Congress, Sacramento, Cal.—Gentlemen: I send you hearty greetings and my earnest wishes for the fullest success of your convention. I congratulate you on the progress of the great movement you represent. There is no movement more emphatically for the benefit of the small farmer and the small ranchman. There is no other way to assist the actual settler and home-maker who owns and tills his own land so powerfully as through this movement of yours for the wise use and preservation of the waters and the forests. The reclamation service and the forest service are directly adapted to help the small man make and maintain a prosperous home; and they are doing it. These services were recently inspected on the ground by the Secretary of the Interior and the Secretary of Agriculture, who have them in charge, and I congratulate you on the high standards of integrity and efficiency they have attained.

It is a matter of sincere satisfaction to learn that you will not confine yourselves to questions of irrigation and forestry, nor even to the control, use and conservation of streams, vastly important as these are to every citizen of the United States. I am glad to know that you will give attention also to that problem of which forestry and irrigation and water conservation form but a part, the fundamental problem of the conservation of all natural resources. The work of the Government along the line of this greater problem cannot be made effective without the approval and support of the whole body of citizens. By educating, guiding and crystallizing public sentiment in this direction, by bringing the needs of the people clearly and forcibly to the knowledge of their representatives, you are rendering a service of the first importance to the nation as a whole.

THEODORE ROOSEVELT.

Other speeches were delivered on Monday by Senator George C. Perkins, Arthur R. Briggs, president of the California State Board of Trade, Governor Albert E. Meade of Washington, Governor J. S. Cutler of Utah, and by various foreign representatives.

Tuesday's session was largely taken up with the consideration of the conservation of our natural resources and privileges. The different speakers warned their auditors of the dangers of the unrestrained waste of the forests, natural gas, coal and oil, and the over-grazing of ranges. They recommended the protection of the inland waterways, and the improvement of land through drainage. Interruptions were caused by the complaints of the representatives of the Owens River farmers that the Government has withdrawn public land from entry for three years in Owens Valley, to enable Los Angeles to secure a water supply.

An address on the "Conservation of Resources" was delivered by Gifford Pinchot, United States Forester. Extracts from this speech appear on editorial page.

Dr. J. W. McGee, Chief of the United States Bureau of Soils, said in part:

"While the annual loss through soil waste is a tremendous evil, far greater than is easily conceived, other resulting ills are hardly less, perhaps even greater, though more difficult to measure. For example, it is the load of sediment borne by rivers which renders them difficult to regulate and control. None but sediment-bearing currents undermine and bore through dams and other engineering works, and none but those fill reservoirs with debris, destroying their value within a few years.

"Special methods which ought to be pursued by the present American citizens, may be enumerated as (1) Reforestation of mountain areas devasted by fire or destructive lumbering in order to protect the slopes from erosion; (2) Judicious administration of grazing in the highlands with a view to protecting that forest cover on which the purity of the mountain streams depends; (3) Increase in stock-growing in lowland farms, where breeds are more effectively improved than on the ranges while the stock serves as a safeguard against crop failure; (4) Substitution of dredging for hydraulic mining and regulation of the industry in such wise as to protect streams from debris and aid in the control

of floods, and as to extract both gold and structural materials and leave arable lands equal or superior to those produced by nature; (5) Development of navigation in the Sacramento from its mouth to Red Bluff, in the Feather to Oroville, and in the San Joaquin to the fields of Fresno, partly for the purpose of inducing individuals and corporations to protect waterways from self-interest, partly to control the cost of transportation; (6) Control of the region of all streams by dams and reservoirs designed primarily for power, and use of this power for all purposes, including lighting, heating, manufacturing and rail transportation; (7) Development of pisciculture and fisheries in the clarified streams; (8) Intensive agriculture, including the invention and making of new crop plants adapted to present climate by those processes of crossing and selection so successfully applied by Burbank; (9) Irrigation in favorably situated districts; (10) Reclamation of overflow lands, salt marshes and alkali lands by means of engineering and other devices; (11) Improvement and multiplication of transportation facilities, including telephone and automobile lines, and the replacement of steam motors by gas motors and electric power; and (12) above all else the cultivation and development of the home sense to the extent that each home will become at once a family shrine and a link in the chain of national spirit."

Among other speakers during the day were Senator F. G. Newlands, of Nevada, who spoke regarding inland waterways; Geo. C. Pardee, of California, who delivered an address on "National Forestry"; W. A. Williams, of Oregon; John A. Fox, of Arkansas; J. A. Holmes, of the Department of the Interior, and Geo. Barstow, who talked on the aims of the National Drainage Association.

Tuesday evening, Morris Bien, of the United States Reclamation Service, spoke on the "Community Idea in the Reclamation Act." "The Work of the National Reclamation Service," was the subject discussed by F. H. Newell, director of the United States Reclamation Service. It was illustrated with stereopticon views. Newell said, in part:

"The reclamation service has now finished the first of its great works, and has passed the period of maximum activity. Beginning with the signing of the act by President Roosevelt on June 17, 1902, the service has expended in each of the succeeding years about as follows: 1903, $1,000,000; 1904, $2,000,000; 1905, $5,000,000; 1906, $10,000,000; 1907, $15,000,000. It will have for the next year, 1908, about half of the amount available in 1907, or $7,000,000. From this time on the work must be done by expending the income or increment to the fund.

"The chief difficulty encountered during the last year has been due to high prices of labor and material and slowness of delivery of freight. Most of the contractors have been forced to ask for extension of time, and some have thrown up their contracts because of these troubles. Nevertheless, the work has been pushed forward with energy and economy and construction completed to the point where funds no longer permit of large expenditures."

M. O. Leighton, United States Hydrographer, spoke on "Conservation of Water." He said, in part:

"We could use with profit all of the water that goes to waste. In a comparatively short time the saving of that water will be a dire necessity. If started now the conservation of water resources could be accomplished with comparatively small expenditure. Every year that it is postponed will add to the price.

"This is a Federal matter, conforming closely to the accepted definition of a Federal matter, and it would be difficult to find a question that affects more specifically every man, woman and child without reference to locality, or that is so utterly regardless of State boundaries.

"The problems were laid down ages before State boundaries were thought of, and it would be as futile to attempt to separate these problems according to State boundaries as it would be to bring about a distribution of the winds to conform to the specific needs of each State."

Practical irrigation, agriculture and settlement were the features of the addresses during the sessions of the National Irrigation Congress on Wednesday.

The first address was by Elwood Mead, on "Some Things Needed to Secure the Highest Development of the Arid Region." Professor E. J. Wickson, of the agricultural department University of California, read the paper of A. C. True, director of experimental stations, United States Department of Agriculture. True could not be present. The subject of the paper was "Irrigation and Drainage Investigations." W. A. Ward, director of the Rice Growers' Association, of Beaumont, Tex., had as his subject, "Rice Irrigation." Robert D. Manson, a Chicago banker, spoke during the session on "Financing Irrigation Enterprises." Governor Kibbey, of Arizona, was heard at the afternoon session on "Water Users' Associations." C. M. Mott, general immigration agent of the Northern Pacific Railway Company, gave an interesting talk on the "Settlement of Irrigated Lands." W. J. McAllister, general agent of the Southern Pacific Railway, spoke on "The Settlement of Irrigated Lands." Professor Samuel Fortier delivered an able paper on "The Greatest Need of Arid America." His main contention was the settlement of irrigated lands. He said that the irrigation projects amounted to little without the strong arm, sound judgment and tireless energy of the farmers. He stated that 5,000,000 acres of land were to be opened for homes after irrigation projects were completed, and every effort should be made to encourage settlement. Fred L. Roeding, of the Department of Agriculture, spoke of the "Relation of Irrigation to Dry Farming." L. L. Dennett, of Modesto, spoke on "Municipal Irrigation Systems."

With regard to the charges of bad faith in the Owens Valley Reservation, Gifford Pinchot stated:

"We admit that we have done everything we could to help out the city of Los Angeles in its water project on the theory of doing the greatest good to the greatest number. These charges have been threshed out by the Forestry Bureau, by two Secretaries of the Interior, by the Reclamation Service, and by the President of the United States, and they found nothing in them. I know of no public proceeding that has been so thoroughly scrutinized as this Owens Valley matter. The rights of Los Angeles were granted with the full accord of the California delegation in Congress.

"Complaint has been made that we placed in the forest reserve a large area of land, covered with only sagebrush. The law gave us this right, and we did so for other reasons than to protect the water rights of the Los Angeles project. The matter of restoring this tract to settlement soon will be submitted to the California delegation.

"I want to say that these attacks such as I have heard today against men of the reputation of Mr. Newell and Mr. Lippincott are not fair."

During the evening session E. H. Harriman spoke of the policy of the Southern Pacific Company.

THE 1907 NATIONAL ELECTRIC CODE.

The following is a list of the Rules in the 1907 edition of the National Electrical Code (now being distributed), which have been changed or added since the 1905 edition.

Users of the Code will, no doubt, find this reference of much value, as it will readily enable them to become familiar with the new requirements.

Station and Dynamo Rooms.

Generators—

1-a.—Fine print note recommending water-proof covers.

1-e.—Fine print note requiring water-proof covers in 1905 edition, omitted from 1907 edition.

Conductors—

1-c.—Fine print note added.

Resistance Boxes and Equalizers—

4-a.—Fine print note.

Motors—

Fine print note preceding 8-a; 8-a; 8-b; 8-b fine print note, 2nd paragraph; 8-c first fine print note; 8-d; 8-d fine print note; 8-f fine print note; 8-j new rule added.

Outside Work.

Wires—

12-a; 12-a fine print note in 1905 edition, omitted in 1907 edition; 12-f fine print note; 12-g fine print note.

Grounding Low Potential Circuits—

13A, section 3, page 25; section 3, page 26; 13A-c; 13

13A, section 3, page 25; section 3, page 26; 13A-c; 13A-g fine print note.

Inside Work.

Wires—

14-c fine print note; 14-e first fine print note.

Switches, Cut-outs, Circuit Breakers, etc.—

17-a; 17-a, fine print note; 17-b, fine print note added; 17-c, fine print note added; 17-d; 17-d, fine print note added.

Constant Potential Systems.

Automatic Cut-outs—

21-a, second fine print note added; 21-b, fine print note added; 21-d, second paragraph; 21-d, last fine print note in 1905 edition omitted from 1907 edition.

Switches—

22-b, cross reference to 17-c added; 22-b, second fine print note; 22-c; 22-e, fine print note added; 22-f, new rule.

Electric Heaters—

23-a.

Low Potential Systems.

Wires—

24-e, fine print note; 24-f, fine print note; 24-g, fine print note, 24-k, new rule added; 24-1; 24-1, fine print note; 24-m; 24-m, fine print note; 24-r, second paragraph; 24-r, second fine print note added; 24-s; 24-u, fine print note added.

Armored Cables—

24A-a; 24A-b, second fine print note added.

Interior Conduits—

25-d, second fine print note added.

Metal Mouldings—

25A, new rules governing installation of metal mouldings.

Fixtures—

26-d, new rule.

Sockets—

27-b; 27-b, fine print note in 1905 edition, omitted in 1907 edition; 27-c, new rule.

Flexible Cord —

28-b, fine print note added; 28-e.

Decorative Lighting Systems—

31-b in 1905 edition prohibiting incandescent lamps in series for inside decorative lighting, omitted from 1907 edition.

Theatre Lighting—

31A, new rules governing theatre lighting.

Car Wiring and Equipment of Cars—

32-b, section 5, fine print note; 32-d, section I, change in cross reference; 32-e, section I.

Car Houses—

33-c; 33-c, fine print note; 33-d; 33-e, changed and three sections added; 33-f, new rule; 33-g, new rule.

High Potential Systems.

Wires—

35-b; 35-c.

Fittings and Materials.

Wire—

40-a; 40-b, fine print note; 41-b; 41-h; 41-i; 42, fine print note preceding 42-a; 42-a, second fine print note in 1905 edition, omitted from 1907 edition; 42b; 42-c; 43-a; 43-a, second fine print note in 1905 edition, omitted from 1907 edition; 44-a.

Flexible Cord—

45-d; 45-f; 47-c, fine print note.

Interior Conduit—

49-j; 49-k; 49-l, new rule; 49-m, new rule.

Switch and Outlet Boxes—

49A-c; 49A-g; 49A-h, new rule; 49A-i.

Mouldings—

50-c to h, new rules governing construction of metal mouldings.

Flexible Tubing—

50-c, rules governing construction of flexible tubing.

Knife Switches—

51-j, fine print note added.

Snap Switches—

51-p, fine print note added; 51-s, second paragraph.

Cut-out Cabinets—

54-b, second fine print note added.

Rosettes—

54A-c, second paragraph.

Sockets—

55-b; 55-d; 55-d, fine print note.

Rheostats—

60-a, fine print note; 60-b; 60-e, second fine print note added.

Signalling Systems—

64-a; 64-a, bold face note changed; 64-d; 64-l, section 2; 64-o; 64-o, fine print note.

Moving Picture Machines—

65A, a to i.

APPROVED APPARATUS.

CONDUIT OUTLET BUSHINGS.

"Bonnell" Couplings for conduit and panel boxes for use with flexible conduit and armored cable. Approved August 2, 1907. Manufactured by

Wm. A. Bonnell, New York, N. Y.

FLEXIBLE CORD, PORTABLE, FOR ELECTRIC HEATER.

"Simplex" for electric heaters. Double or triple conductor cord composed of braided conductors, with rubber and asbestos coverings protected by woven cotton braid. Also "Tan" double or triple conductors, cord of stranded conductors with rubber and asbestos coverings, the several conductors separately protected by woven cotton braid. Approved April 29, 1907. Manufactured by

Simplex Electrical Co., Boston, Mass.

HANGERBOARDS, ARC LAMP.

G. E. Cat. Nos. 2865 and 44,307. Porcelain base hangerboards, carrying plug fuse cutouts, 30A, 250 V. Cat. No. 2865 for concealed work, either with or without slot for branch circuit moulding. Cat. No. 44,307 for concealed moulding or exposed knob and cleat work. Approved August 2, 1907. Manufactured by

General Electric Company, Schenectady, N. Y.

INSULATING MATERIAL.

Peru black glazed porcelain for electrical fittings. Approved August 2, 1907. Manufactured by

Peru Electric Manufacturing Co., Peru, Ind.

LAMP GUARDS.

Protector H. iron wire guard. Approved August 2, 1907. Manufactured by

The Crescent Company, Valparaiso, Ind.

MISCELLANEOUS.

"Skeedoodle" socket plug for inside work only; 16 candlepower, 125-volt. A thermostatic lamp flashes for use on 16 candlepower lamps only. Approved July 23, 1907. Manufactured by the

Electro Ad. Co., Detroit, Mich.

FUSES, CARTRIDGE, ENCLOSED.

"Union." All capacities, 250 and 600 V. Approved June 29, 1907. Manufactured by

V. Formerly manufactured by the Sarco Company, New York. This device, marked "P. & S.", is also listed and approved under "Switches, Fixture, P. & S." Approved for fixture arms only (not canopies), for control of not over one 16 C. P., 110 volt lamp, and when wired with solid (not stranded) conductors. Manufactured by

Pass & Seymour, Inc., Solway, N. Y.

ROSETTES, FUSELESS.

G. E. Cat. No. 43,111. Single piece porcelain base, 3A,

250V. Approved August 2, 1907. Manufactured by

General Electric Co., Schenectady, N. Y.

SWITCHES, KNIFE.

Metropolitan. 125, 250 and 500 volts, all capacities. Approved June 18, 1907. Manufactured by

Metropolitan Switchboard Co., New York, N. Y.

SOCKETS, STANDARD.

G. E. brass shell, key and keyless sockets, with or without shade holders, Edison type, key, Cat. Nos. 9386, 1317, 50,760, 1318 and 99,386. Keyless, Cat. Nos. 9392, 1319, 50,768, 1320 and 99,392. T. H. types, key, Cat. Nos. 50,713 and 50,761. Keyless, Cat. Nos. 50,714 and 50,769. Approved April 17, 1907. Manufactured by

General Electric Co., Schenectady, N. Y.

SWITCHES, COMBINATION CUTOUT.

Bryant knife switches with Edison plug cutouts, 15A, 125V. Cat. Nos. 1851, 1982, 1852, 1983, 1947 and 1984. 25A, 125V, Cat. Nos. 1965 and 1981, 25A, 250V, all types. Approved August 2, 1907. Manufactured by

Bryant Electric Co., Bridgeport, Conn.

C. E. M. Co., 15 and 25A, 125V, 3 to 2-wire and 2 to 2-wire, double branch panel and combination cutouts, with plug fuses. Approved August 2, 1907. Manufactured by

Conn. Electric Mfg. Co., Bantam, Conn.

D. & W. panel cutout knife switch and plug fuses, 25A, 125V. Cat. Nos. 25,028 and 25,029. Approved August 2, 1907. Manufactured by

D. & W. Fuse Co., Providence, R. I.

H. R. E. Co., 25A, 125V, knife switch, with plug fuse cutout extension. Approved August 2, 1907. Manufactured by

Holabird-Reynolds Electric Co., Los Angeles, Cal.

Trumbull, 15A, 125V, Cat. Nos. 714-719, inclusive. Approved August 2, 1907. Manufactured by

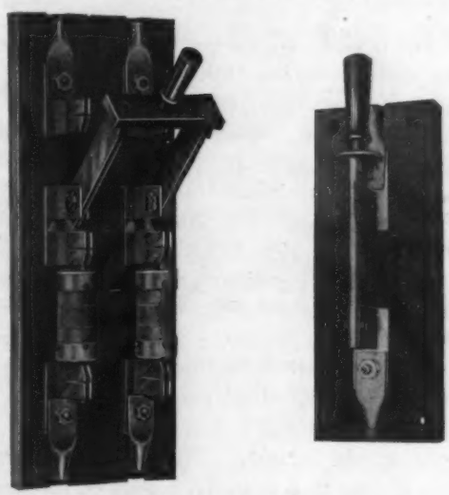
Trumbull Electric Mfg. Co., Plainville, Conn.

SWITCH BOXES.

"Atkinson." A galvanized steel box with sliding clamps to secure flexible tubing or armored cable. For knob and tube work. Approved July 9, 1907. Manufactured by

Wm. R. Atkinson, New York, N. Y.

G. E. Type L, Form D-12. (Superseding approved Type L, Form D-2.) All capacities, 250 V. D. C., including



types equipped with extensions for link or N. E. Code Standard enclosed cartridge fuses. Approved July 22, 1907. Manufactured by

General Electric Co., Schenectady, N. Y.

SWITCHES, FIXTURE.

"Noscru." Fixture arm switch. Single pole, ½ A, 125

SWITCHES, KNIFE.

"Davis" Type B, all capacities, 250 V. Approved July 11, 1907. Manufactured by

Menominee Electric Mfg. Co., Menominee, Mich.

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EDITORIAL.

PREVALENT LAWLESSNESS.

The celebration of Labor Day was marred by numerous outbreaks of violence, commencing with the storming of street cars before the parade started, and culminating with the brutal murder of a policeman during the night. Thousands of men who marched in the Labor Parade are law-abiding and admirable citizens who deeply deplore the disgraceful events, for the responsibility of which, however, the whole body of organized labor cannot be excused. Some of the labor leaders have attempted to wash their hands of responsibility for the outrages, maintaining that they were precipitated by the attempted movement of street cars to interfere with the parade. But such contention is not warranted by the evidence; nor, if it were true, would it be any palliation for the disgraceful scenes which resulted.

The shameful events of Labor Day demonstrate all too plainly that gross lawlessness is still liable to occur on the streets of San Francisco, menacing life and property and making this city a by-word throughout the world. It is impossible to ignore the shameful facts, and it is proper to consider from what source such spirit of lawlessness springs. What, for instance, was the instigation that led a nineteen-year-old member of the Structural Iron Workers' Union to his death as one of the ringleaders of the mob which stormed a Sutter Street car last Monday? What prompted miscreants to hurl cobble stones through the windows of the residence of the late general manager of the United Railroads? What is the spirit that is at the root of all the mob riot that disgraced Labor Day and once more sullied the good name of San Francisco?

It is not sufficient to say that these outrages were the explosions of individual hatred, malice and revenge. Those passions undoubtedly animated the disappointed strikers and their sympathizers; but if a high standard of law and order were maintained, and every member of society was enforced to regard the majesty of the law, and fear the consequences of its violation, such numerous outbreaks would be impossible.

Such explosions of violence are the symptoms of a lawlessness which has been prevalent since the start of the carmen's strike, and for which the leaders of organized labor are directly responsible. With the object of preventing the United Railroads from operating its cars in a lawful manner, but independently of the Labor Unions, a general strike committee was organized. The main object and the principal tactics of that committee have been unlawful since its organization. Its avowed purpose has been to force the United Railroads to do its bidding by means of unlawful boycotts, both upon the business of the company, and its patrons. Such a combination forms an illegal conspiracy, and every member of the committee is guilty of a violation of the laws of this State.

"Until the public sentiment of this city," says the president of the United Railroads, "awakens to a condemnation of such illegal boycotts, we may expect such lawless outbreaks as occurred on Labor Day. The men who threw stones, demolished cars and created riot and bloodshed are the tools of this illegal conspiracy, and the real responsibility lies back of the stone-thrower."

CONSERVATION OF RESOURCES

At the National Irrigation Congress at Sacramento Gifford Pinchot, chief of the Forest Reserves said:

"As a people we have been in the habit of declaring certain of our resources to be inexhaustible. To no other resources more frequently than coal has this stupidly false adjective been applied. Yet coal supplies are so far from being inexhaustible that if the increasing rate of consumption shown by the figures of the last seventy-five years continues to prevail, and there is every reason to believe that it will grow rather than lessen, our supplies of anthracite coal will last about fifty years, and of bituminous coal but a little over a hundred years. From the point of view of national life, this means the exhaustion of one of the most important factors in our present civilization within the immediate future.

"The waste in use is not less appalling. But 5 per cent of the potential power residing in the coal actually mined is saved and used. For example, only about 5 per cent of the

power of the 150,000,000 tons annually burned on the railroads of the United States is actually used in traction; 95 per cent is lost. In the best incandescent electric lighting plants but one-fifth of 1 per cent of the potential value of the coal is converted into light.

"Many oil and gas fields, as in Pennsylvania, West Virginia and the Mississippi Valley have already failed, yet vast amounts of gas continue to pour into the air and great quantities of oil into the streams. Cases are known in which vast amounts of oil are systematically burned in order to be rid of it. The prodigal squandering of our mineral fuels proceeds unchecked in face of the fact that such resources as these, once used or wasted, can never be replaced. The waste of oil is among the most dangerous of all wastes now in progress in the United States. In 1896 Professor Shaler, than whom no one has spoken with greater authority on this subject, estimated that in the upland regions of the States south of Pennsylvania 3,000 square miles of soil had been destroyed as the result of forest denudation, and that the destruction was then proceeding at the rate of 100 square miles of fertile soil per year. No seeing man can travel through the United States without being struck by the enormous and unnecessary loss of fertility by easily preventable soil wash. The soil so lost, as in the case of many other wastes, becomes itself a source of damage and expense, and must be removed from the channels of our navigable streams at an enormous annual cost.

"The destruction of forest plants by over-grazing has resulted, in the opinion of men most capable of judging, in reducing the grazing of the public lands by one-half. The destruction of forest plants is accompanied by a loss of surface soil through erosion, by forest destruction, by corresponding deterioration in the water supply, and by a serious decrease in the quality of the waste of animals grown on over-grazed lands.

"The lowest estimate reached by the forest service of the timber now standing in the United States is 1,400 billion feet, board measure, the highest is 2,000 billion. The present annual consumption is approximately 100 billion feet, while the annual growth is but a third of the consumption, or from thirty to forty billion feet. If we accept the larger estimate of the standing timber, 2,000 billion feet, and the larger estimate of the annual growth, forty billion feet, and apply the present rate of consumption, the result shows a probable duration of our supplies of timber of not more than thirty-three years. It is evident that all the waste must, if possible, be prevented."

"The conservation of the inland waterways of the United States constitutes, perhaps, the greatest single task which now confronts the nation. The maintenance and increase of agriculture, the supply of clear water for domestic and manufacturing use, the development of electrical power, transportation and lighting, and the creation of a system of inland transportation by water, whereby to regulate freight rates by rail and to move the bulkier commodities cheaply from place to place, is a task upon whose successful accomplishment the future of the nation depends in a peculiar degree. This is the problem to which the inland waterways commission, recently appointed by President Roosevelt, has begun to address itself.

"We are accustomed, and rightly accustomed, to take pride in the vigorous and healthful growth of the United States and its vast commerce for the future. Yet we are making no preparation to realize what we so easily and glibly foresee and predict. The vast possibilities of our great future will become realities only if we make ourselves, in a sense, responsible for that future. The planned and orderly development and conservation of our national resources is the first duty of the United States. It is the only form of insurance that will certainly protect us against disasters which lack of foresight has repeatedly brought down on nations passed away."

PERSONAL.

Frank Fowden, of Brooks-Follis Co., is in the south on a business trip.

J. T. MacLean, hydro-electric engineer, New York City, has been investigating the mineral resources of Ashland, Oregon.

E. G. Dewald, manager of the Platt Iron Works, has returned to Dayton, Ohio, after an extended visit to the Pacific Coast.

W. A. Purcell, formerly with the sales department of the California Electrical Works, has become associated with E. J. Hall Co., of 527 Mission Street, San Francisco.

E. N. Percy, assistant engineer, Mechanical Department, Atlantic, Gulf & Pacific Co., of New York City, is visiting San Francisco for a short time, after an extensive European trip.

NUCLEUS OF OAKLAND ELECTRIC POWER PLANT OF SOUTHERN PACIFIC CO.

The Southern Pacific Company has ordered two 5,000-kilowatt Westinghouse-Parsons turbo-generators for their new Oakland power plant, to supply electricity for the proposed electrification of their local lines. These, together with 12 Parker boilers, ordered from the Keystone Boiler Works, and the Worthington condensers, for which Hunt, Mirk & Co. are Pacific Coast agents, furnish the nucleus of the new plant.

CONVENTION AT MADISON SQUARE GARDEN.

During the Electrical Show, September 30th to October 9th, two conventions will be held in the Concert Hall at Madison Square Garden. At recent meetings of all the locals of the Street Railway Association of the State of New York, and the employes of the State Gas and Electric Association, it was decided to hold the annual gathering at Madison Square Garden during the Electrical Show, because of the appropriateness of the occasion. Issues of national moment will be dicussed and addresses will be made by famous electricians.

OUTING FOR ELECTRICAL JOBBERS.

The Electrical Jobbers of the Pacific Coast have arranged for a little outing at Santa Cruz from September 28th to 29th inclusive. The object is to promote the spirit of good fellowship among those engaged in the electrical business. An unusually able committee has been appointed to arrange a program of athletic sports which will include a ball game, a swimming contest, and a trip to the Big Trees. The program of entertainment will also include a basket picnic at the Santa Cruz summer home of Mr. Albert H. Elliot. Saturday night a good fellowship dinner will be given at a nominal expense at which everybody is expected to pay for his own. Several of those who contemplate going will be accompanied by their wives or sweethearts, and all the necessary arrangements will be made to entertain and take care of them.

LOCAL STOCKS AND BONDS

Furnished by Courtesy San Francisco Stock and Bond Exchange.

Outstanding	INTEREST	MISCELLANEOUS BONDS.	AUGUST 30		AUGUST 31		SEPT. 3		SEPT. 4		SEPT. 5	
			Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked
1,532,000	F & A	Associated Oil Co. 5%	78	80	78	80	78	80	.....	80	.....	80
2,250,000	M & S	Bay Counties Power Co. 5%	.....	95 ½	.....	95 ½	.....	.....	.....	.....	91	93
1,000,000	F & A	Cal. Central Gas & El. 5%	.....	100	.....	100	.....	100	.....	100	.....	100
9,600,000	M & S	Cal. Gas & El. Gen. M. & C. T. 5%	.....	80	.....	80	.....	79	.....	76	.....	77 ½
900,000	J & J	California St. Cable Co. 5%	100 ½	102	.....	102	.....	102	.....	102 ½	.....	102 ½
2,000,000	J & J	Contra Costa Water Co. 5%	99 ¾	100 ¼	.....	100 ½	.....	100 ½	.....	100 ½	.....	100 ½
1,000,000	J & J	do do Gen. Mtg. 5%	.....	96	.....	96	.....	96	.....	96	.....	96
623,000	F M A N	Edison Light & Power 6%	109	112	109	112	109	112	109	112	109	112
650,000	M & S	Ferries & Cliff Ho. Ry. 6%	.....	108 ½	.....	108 ½	.....	.....	.....	.....	.....	.....
671,000	A & O	Geary St. Ry. 5%	52	.....	52	.....	52	.....	52	.....	52	.....
610,000	M & N	Honolulu R. T. & L. Co. 6%	105 ½	.....	105 ½	.....	105 ½	.....	105 ½	.....	105 ½	.....
300,000	A & O	Lake Tahoe Ry. & T. Co. 5%	.....	102 ½	.....	102 ½	.....	102 ½	.....	102 ½	.....	102 ½
500,000	J & J	Los Angeles Elec. Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100
1,300,000	J & J	Los Angeles Gas & Elec. Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100
5,000,000	A & O	Los Angeles Ry. 5%	109 ½	.....	109 ½	.....	109	.....	109 ½	.....	109 ½	110 ¼
1,000,000	A & O	Los Angele Lighting Gd. 5%	.....	103	.....	103	.....	103	.....	103	.....	103
1,500,000	A & O	Los Angeles Pac. R. R., 1st Con. Mtg. 5%	102 ¾	103 ¼	102 ¾	103 ¼	102 ¾	103 ¼	102 ¾	103 ¼	102 ¾	103 ¼
3,030,000	M & S	L. A. Pac. R. R. of Cal. 5%	.....	101	.....	101	.....	.....	.....	.....	.....	.....
3,000,000	J & J	Market Street Cab'e 6%	.....	108	.....	107 ½	.....	107 ½	.....	108 ½	.....	108 ½
5,141,000	M & S	do Ry. 1st Cons. Mtg. 5%	.....	103	.....	103	.....	101 ½	.....	102	.....	102 ½
100,000	A & O	Mill Valley & Mt. Tamalpais S. Ry. 5%	103	.....	103	.....	103	.....	103	.....	103	.....
4,751,000	A & O	Northern Ry. Co. of (Cal.) 5%	.....	113	.....	113	112 ½	113 ½	112 ½	113 ½	.....	113
1,498,000	J & J	North Pacific Coast R. R. 5%	100	101 ½	100	101 ½	100	101 ½	100	101 ½	100	101 ½
1,074,000	J & D	Northern Cal. Railway 5%	105	.....	105	.....	105 ½	.....	105	.....	105	.....
980,000	J & D	Northern Cal. Power Co. 5%	.....	95	.....	95	.....	95	.....	95	.....	97 ½
6,000,000	A & O	Northern Electric Co. 5%	.....	97 ½	.....	97 ½	.....	97 ½	.....	97 ½	.....	97 ½
1,000,000	M & S	Oakland Gas Light and H. 5%										
1,374,000	J & J	Oakland Transit Co. 6%	109 ½	.....	109 ½	.....	109 ½	.....	109 ½	.....	109 ½	.....
1,600,000	J & J	Oakland Transit 5%	104	.....	104	.....	104	.....	104	.....	104	.....
1,326,000	J & J	Oakland Transit Con. 5%	.....	103	.....	103	.....	103	.....	103	.....	103
7,000,000	J & J	Oakland Traction Con. 5%	.....	99 ½	.....	99 ½	.....	99 ½	.....	99 ½	.....	99 ½
1,500,000	J & J	Oakland Water Co. gtd. 5%	.....	99 ½	.....	99 ½	.....	99 ½	.....	99 ½	.....	99 ½
2,000,000	A & O	Omnibus Cable Ry. 6%	.....	112	.....	112 ½	.....	112 ½	.....	112	.....	112
1,149,000	S D M J	Pacific Gas Imp. 4%	.....	92 ½	.....	92 ½	.....	95	.....	95	.....	95
8,494,000	J & J	Pacific Electric Ry. Co. 5%	.....	104	.....	104	.....	104	.....	104	.....	104
4,491,000	J & J	Pacific Light & Power Co. 5%	.....	98	.....	98	.....	98	.....	98	.....	98
3,000,000	J & J	Pacific Tel. & Tel. Co. 5%	.....	103	.....	103	.....	103	.....	103	.....	103
350,000	J & J	Park & Cliff House Ry. 6%	.....	104	.....	104	.....	104	.....	104	.....	104
250,000	J & J	Park & Ocean R. R. 6%	.....	104	.....	104	.....	104	.....	104	.....	104
700,000	M & S	Powell Street Railway 6%	.....	107 ½	.....	107 ½	.....	.....	.....	.....	.....	.....
2,500,000	M & N	Sacramento Elec. Gas & Ry. 5%	100	101	100	101	100	101	100	101	100	101
6,000,000	A & O	S. F. & S. J. Valley Ry. 5%	112 ½	113	112 ½	113	112 ¼	113	112 ½	113	112 ½	112 ¾
3,000,000	J & J	S. F., Oak. & San Jose Ry. 5%	103 ½	105	103 ½	105	103 ½	105	103 ½	105	103 ¾	105
1,500,000	J & J	do do 2d Mtg. 5%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,500,000	A & O	S. J. & S. Clara Co. R. R. 4 ½%	.....	95	.....	95	.....	95	.....	95	.....	95
642,000	A & O	Sierra Ry. of Cal. 6%	104 ¾	.....	104 ¾	.....	104 ¾	.....	104 ¾	.....	105	.....
6,000,000	J & J	S. P. R. R. of Arizona 6% (1909)	101	.....	101	.....	101	.....	101	.....	101	.....
4,000,000	J & J	do do do (1910)	102	.....	102	.....	102	102 ½	102	102 ½	101 ¾	.....
5,116,000	A & O	S. P. R. R. of Cal. 6% (1912)	108	.....	108	.....	108	.....	108	.....	108	.....
4,127,500	M & N	S. P. R. R. of Cal., 1st c. gtd. 5%	.....	118	.....	118	.....	118	.....	118	.....	118
3,533,000	A & O	S. P. Branch Ry. of Cal., 6%	124	125 ½	124	125 ½	123 ½	.....	123 ½	126	124	125 ½
81,178,000	J & J	S. P. R. R. Co., 1st Ref'd'g. 4%	88 ¾	.....	88 ¼	.....	88	89	.....	88 ¾	88 ¼	88 ½
17,500,000	J & D	Spring Valley Water Co. Gen. Mtg. 4%	85	.....	85	.....	84 ½	.....	85	.....	85 ¼	87 ½
300,000	M & S	Stockton Gas & Elec. Co. 6%	100	.....	100	.....	100	.....	100	.....	100	.....
2,000,000	J & J	United Gas & Elec. Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100
20,000,000	A & O	United R. R. of S. F. 4%	70	70 ¼	70	70 ½	70	70 ½	.....	70 ¼	.....	70 ¼
2,500,000	M & N	Valleys Counties Power Co. 5%	.....	95 ½	.....	95 ½	.....	95 ½	.....	95 ½	.....	95 ½
		Water Stocks.										
.....	.....	Contra Costa	.....	62	.....	62	.....	62	.....	62	.....	62
6,000	Quarterly	Marin County	.....	60	.....	60	.....	60	.....	60	.....	60
280,000	.....	Spring Valley Water Co.	23 ¼	23 ½	23	23 ½	23	23 ½	23	23 ½	23 ½	23 ½
		Gas and Electric Stocks.										
37,500	.....	Martel Power Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9,340	.....	Mutual Electric Light Co. (Ctfs.)	4 ½	.....	4 ½	.....	4 ½	.....	4 ½	.....	4 ½	.....
37,336	.....	do (Extended Ctfs.)	12 ¾	.....	12 ¾	.....	12 ¾	.....	12 ⅞	.....	12 ⅞	.....
40,000	Monthly	Pacific Lighting Co.	65	67 ½	65	67 ½	65	67 ½	65	67 ½	65	75
12,000	.....	Stockton Gas & Elec. Co.	52	.....	52	.....	52	.....	52	.....	52	.....
		Street Railroad Stocks.										
10,000	.....	California	.....	140	.....	140	.....	140	.....	140	.....	140
10,000	.....	Geary	.....	30	.....	30	.....	30	.....	50	.....	30
10,000	.....	Presidio	.....	25	.....	25	.....	25	.....	25	.....	25
	Semi-an.	Associated Oil Co.	27 ¾	28 ¼	.....	28 ¼	27 ⅞	.....	.....	28	27	.....
1,625	Quarterly	Mill Valley & Mt. Tamalpais S. Ry.	.....	110	.....	110	.....	110	.....	110	.....	110
180,000	Quarterly	Pac. Tel. & Tel. Co. (Pfd.)	80	85	80	85	80	85	80	.....	80	85
180,000	.....	Pac. Tel. & Tel. Co. (Common)	11	12	11	12	11	12	10	.....	10	12

Unlisted Securities

750,000	A & O	Bay Counties Power Co. 6%	97	.....	97	.....	97	.....	97	.....	97	.....
745,000	M & S	Blue Lakes Water Co. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,000,000	A & O	California Northwestern Ry. 5%	.....	108	.....	108	.....	108	.....	108	.....	108
160,000	J A J O	Marin County Water 5%	.....	100	.....	100	.....	100	.....	100	.....	100
600,000	J & J	Risdon Iron Works 5%	.....	100	.....	100	.....	100	.....	100	.....	100
500,000	M & S	S. F. Dry Dock 5%	.....	109	.....	109	.....	109	.....	109	.....	109
8,000,000	M & N	S. F. Gas & Electric 4 ½%	.....	95	.....	95	.....	95	.....	95	.....	95
3,926,000	J & J	S. F. & North Pacific Ry. 5%	101	105	.....	104	.....	104	.....	104	.....	104
5,500,000	J & J	South Pacific Coast Ry. 4%	.....	95	.....	95	.....	95	.....	95	.....	95
.....	.....	Standard Electric Co. 5%	.....	80	.....	80	.....	80	.....	80	.....	80
.....	.....	do do Gtd. 5%	.....	85	.....	85	.....	85	.....	85	.....	85
750,000	J & J	Sunset Tel. & Tel. Co. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,250,000	A & O	Sunset Tel. & Tel. Co. 5%	.....	103 ½	.....	103 ½	.....	103 ½	.....	103 ½	.....	103 ½
1,000,000	M & N	Sutter Street Railway 5%	.....	104	.....	104	.....	104	.....	104	.....	104
		Stocks.										
50,000	Monthly	Gas Consumers' Association	.....	21	.....	21	.....	21	.....	21	.....	21
100,000	Monthly	Northern Cal. Power Co.	24 ½	25	24	25	24	25	.....	25	24	25
.....	.....	Pac. Gas & Elec. (Pfd.)	.....	46	.....	46	44	.....	44	47 ½	44	.....
.....	.....	Santa Cruz Port. Cement	.....	50	.....	50	.....	50	.....	48	.....	48
.....	.....	Standard Port. Cement (New)	.....	52 ½	.....	52 ½	.....	52 ½	.....	50	.....	50
50,000	Monthly	Truckee Electric Co.	.....	15 ½	.....	15 ¼	.....	15 ¼	.....	15 ¼	.....	15 ¼

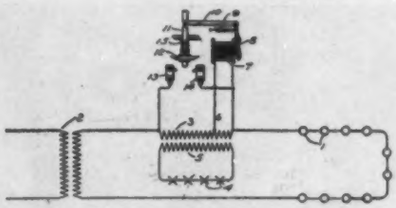
PATENTS

Electric, Gas and Water.

Specially reported for the Journal of Electricity, Power and Gas.

PROTECTIVE DEVICE FOR SERIES TRANSFORMERS. 863,163. Charles E. Eveleth, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York. Filed November 12, 1904. Serial No. 232,463.

In an electrical system, a plurality of translating devices,



means for supplying a substantially constant current thereto, a transformer having its primary winding in series with said devices and its secondary winding connected to a normally closed local circuit, a tap for one of said windings, and automatic means connected to said tap for preventing an abnormal decrease in the current through said translating devices when the current in said local circuit is interrupted.

COMBINED TELEPHONE RECEIVER AND TRANSMITTER. 863,617. Rodney F. Ludlow, Philadelphia, Pa. Filed April 6, 1904. Serial No. 201,794.

In a telephone, a combined receiver and transmitter comprising a suitable casing, concentrically arranged electro-magnetic and electric sound-transforming devices, a single diaphragm common to both and arranged exterior to their electric circuits, with means to conduct electrically-induced sound waves to and from said diaphragm, said means comprising a variable resistance conductor in series with the windings of the magnet, and mechanism contacting with the diaphragm and operating to directly transmit its vibrations to the resistance-conductor.

BRUSH-HOLDER FOR ELECTRIC MOTORS, OR THE LIKE. 863,683. Thomas S. Watson, Milwaukee, Wis. Filed September 1, 1906. Serial No. 332,999.

1. A carbon brush-holder for electric motors or generators, the same comprising jaws having oppositely-disposed parallel ways that are tapered in cross-section to form guides, and the brush having taper edges corresponding to said guides with which they are engaged.

2. A carbon brush-holder for electric motors or generators, comprising jaws having oppositely-disposed parallel ways, said ways being tapered in cross-section to form guides for correspondingly shaped tapered edges of a carbon, and means for regulating the set of the jaws, whereby a simultaneous lateral and transverse adjustment of the carbon with relation to said ways is obtained.

GOVERNING MECHANISM FOR TURBINES. 863,782. John G. Callan, Lynn, Mass., assignor to General Electric Company, a corporation of New York. Filed February 5, 1907. Serial No. 355,824.

In a governing mechanism, the combination of valves controlling the passage of fluid, an actuator for each valve, a toothed disk for moving the actuators which is common thereto, a constantly-vibrating lever, means for transmitting motion from the lever to the disk, a device responsive to load changes for controlling the action of said means which causes it to impart a step-by-step movement to the disk, and mechanism actuated by the disk which decreases the length of the steps as the disk is moved under the control of the device to cause the valves to more nearly satisfy the load conditions.

HYDRAULIC NOZZLE SUPPORT. 863,795. George J. Henry, Jr., San Francisco, Cal., assignor of one-half to The Pelton Water Wheel Company, San Francisco, Cal., a corporation of California. Filed June 3, 1903. Serial No. 159,940.

1. The combination with a main supply pipe, of a discharge nozzle movably connected thereto, a strut attached to the outer end of the movable nozzle, a fixed support for the opposite end of the strut, and a hinge between the fixed support and the strut, the bearing of the hinged connection for the strut being in line with the axis of the nozzle's joint.

2. The combination with a supply pipe, of a deflecting nozzle, movably connected thereto by a swinging joint supporting bearings for the nozzle, a strut interposed between the deflecting nozzle and a fixed support to which the strut is hinged at its inner end, the outer end of the said strut being attached to the nozzle, said strut being hinged to swing with the nozzle.

SMOKE-CONSUMING BOILER-FURNACE. 863,597. Henry H. Freeman, Wilkinsburg, Pa. Filed Oct. 11, 1906. Serial No. 338,493.

In a furnace, the combination of a heat-absorbing element, a fuel combustion chamber in front of said heat-absorbing element, a wall separating the heat-absorbing element and fuel combustion chamber and providing a supplemental combustion chamber and having a series of openings provided with conical nozzles projecting into the supplemental combustion chamber, a second wall in front of the first wall providing an air chamber between said walls and having a series of straight nozzles open to the fuel combustion chamber and projecting into the conical nozzles of the first wall, and a connection from said air chamber to the atmosphere.

INDUSTRIAL

ELECTRIC POTATO PEELER

Many and various are the machines that electric motors are connected with to supply motive power. The very latest use electric power has been put to, is for peeling potatoes; supplying a long-felt want, and eliminating the undesirable drudgery and waste.

The accompanying illustration shows one of the Century Electric Company's one-half horsepower, single-phase, self-starting alternating-current motors, direct conected with a Robinson patented Victoria vegetable-peeling machine, No. 3, made in Newark, N. J., which peels and washes a barrel of potatoes in five or six minutes, as well as turnips, carrots and beets.

There is quite an interesting history attached to this

very useful invention. In spite of the fact that America gave the world the humble, but very useful, potato, the process of divesting them of their murky jackets has practically remained the same, up to the present date, as at the time they were discovered, hundreds of years ago.

There are forty machines in use by the U. S. Navy, where they have done away with the necessity of having a big gang of sailors sitting down and peeling potatoes.

The peeling in the machine is done by the principle of rotating and agitating the potatoes inside of the machine, against rough, abrading surfaces, while a stream of water plays on them, carrying off the waste into the sewer, and it may be naturally deducted from that, the peeling is accomplished with about one-fourth of the waste on the potatoes, as what it is when done entirely by hand, as the machine only removes the outer thin skin of the potatoes, leaving the most nutritious part on the potatoes to be cooked and eaten, which is that part next to the outer skin.

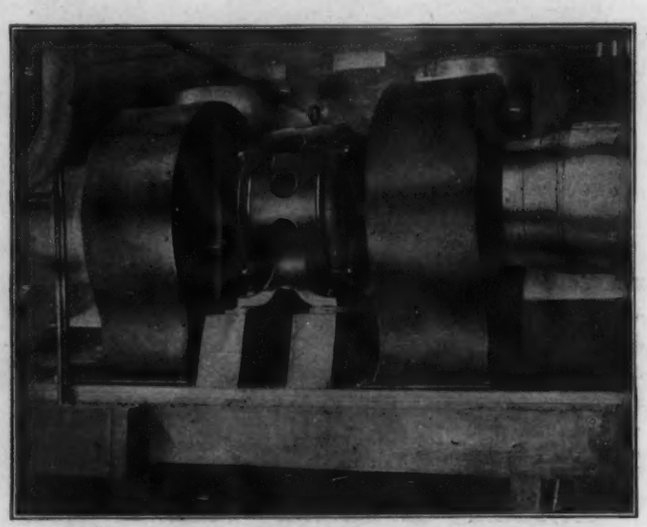
These machines are driven either by a belt, or direct connected with a motor.

VULCAN ELECTRICALLY HEATED TOOLS.

The article describing Vulcan Electrically Heated Tools has been unavoidably delayed, but will appear in our next issue.

ALLIS-CHALMERS MOTOR-DRIVEN CENTRIFUGAL PUMPS.

The accompanying illustration shows two of four single stage, electrically-driven centrifugal pumps built by Allis-Chalmers Company, Milwaukee, for the Delaware, Lackawanna & Western Railroad Co., to be installed at the Bellvue Colliery for mine drainage. These pumps are built completely of acid resisting bronze. Three pumps have a capacity of 250 gallons per minute each against a head of 100 feet, and are operated by 15-horsepower, direct-current, shunt wound, Allis-Chalmers motor. The fourth pump has a capacity of 700 gallons per minute against 100 feet head, and is direct connected to a 30-horsepower direct-current, shunt wound motor.



This type of pump is especially designed by Allis-Chalmers Company for the highest efficiency to be obtained under the conditions existing in each case, and is very well adapted for mine drainage, for the reason that the pumps can be placed in the mines at a considerable distance from the source of power.

The July business of the Westinghouse Electric and Manufacturing Company was considerably above the average. The last information from East Pittsburg stated that the railway department alone showed a record for orders booked approximating about $2,500,000. Among these were two of more than ordinary importance. The Brooklyn Rapid Transit Company contracted for 400 electric railway motors, 200 of which, of 200 horsepower each, are for the elevated railroad cars; while the balance, of 60 horsepower each, will be surface car equipment. In connection with the elevated car equipment, the company will also furnish the Westinghouse multiple unit control. The other large order comes from the Schoepf interests of Cincinnati, which control one of the largest urban and interurban electric railway systems in this country, operating cars in Eastern and Central Ohio and Southern Indiana. This order includes a complete equipment of electrical apparatus for 24 sub-stations, consisting of rotary transformers, transformers and switchboard appliances, as well as four Westinghouse turbo-generators, aggregating 26,000 horsepower.

NEWS NOTES

FINANCIAL.

Roswell, N. M.—September 16 has been fixed as the date of the election to vote $125,000 bonds for the construction of a water works system.

San Francisco.—The General Electric Power Company of California, at a meeting held at 34 Ellis Street, created a bonded indebtedness of $9,000,000 and executed a deed of trust to the Carnegie Trust Company of New York.

San Francisco.—A mortgage for $6,000,000 to secure a six per cent bond issue by the Mercantile Trust Company on behalf of the Northern Electric Company has been filed in the recorder's office. The money will be used to extend the system.

Pasadena.—Opposition is already manifest toward the proposed bond issue of $200,000 for improvements and additions to the municipal lighting plant. It is an open secret that Mayor Barley is chiefly interested in bringing about city ownership of the several water plants. Judge Works of Los Angeles is engaged in sifting the legal status of the water situation.

San Francisco.—The forfeiture of the Spring Valley's franchise and plant has been rescinded by the Board of Supervisors. The city attorney has been instructed to report to the Board the status of the litigation between the city and the Spring Valley as to the collection of water rates and also upon the validity of the present water-rate ordinance.

San Francisco.—Judge Van Fleet, in the United States District Court made permanent an injunction asked for by the Oro Water Company, to apply until the case of the company against the city of Oroville is decided by the courts. In its bill of complaint the company asks that the city of Oroville be restrained from enforcing an ordinance which sets an arbitrary price at which the company was to furnish water to the city and consumers. James Lynch, vice-president of the First National Bank, and Vice-President Wilson of the American National Bank made affidavit that ten per cent is a reasonable amount to receive on the capital invested in a water plant.

INCORPORATIONS.

San Francisco.—The Tavern Oil Company has been incorporated with a capital stock of $100,000, by Bert Lowenstein, Geo. Hinkle, Frank Pauson, Jos. Seeley, C. G. Wilcox, J. W. and S. B. Pauson.

San Diego.—The Imperial Water Company No. 11 has been incorporated with a capital stock of $200,000 by J. M. Prim, B. F. Humphreys, Ernest Edwards, Allen Harvey, and C. H. Harlan, all of Holtville.

San Francisco.—Articles of incorporation have been filed by the Associated Pipe Line Company with a capital stock of $7,000,000 by W. S. Porter, E. E. Calvin, W. F. Herrin, G. L. King, and F. H. Buck.

Los Angeles.—Papers of incorporation for the Pacific Gas Company have been filed. Charles A. Elder is president, R. D. Lost vice-president, and C. Martin secretary. At least $1,000,000 will be expended on the plant.

San Francisco.—The Monterey County Water Works has filed articles of incorporation in the county clerk's office. The capital stock is $2,000,000 and the incorporators are Charles E. Green, H. G. Platt, A. D. Shepard, and George E. Crothers.

Los Angeles, Cal.—With John Wollenshlager, Geo. Bernhard, C. H. Kolle, J. J. Coit, Herman Miller and W. C. Batcheller as directors, the Coit Automatic Air Brake and Trolley Company has been incorporated with a capital stock of $300,000.

Alturas, Cal.—For the purpose of developing oil fields near Canby the Modoc Oil and Development Company has been incorporated with H. G. Beets as its president and general manager; C. B. Daniels, vice-president, and B. C. Mayo, secretary and treasurer.

OIL.

Tacoma, Wash.—The Union Oil Company will establish a distributing station in Tacoma soon. An option has been taken on a site for the plant.

Reno.—Oil has been struck in good quantity and quality on the McLeod ranch, three miles from Reno. Drillers have been at work for a week or two and have encountered good indications ever since the well was started. The flow of oil was struck at a depth of seventy-four feet, the petroleum stream being of good quality. The owner of the well will keep the drills going until they reach 250 feet, in the hope of striking an exceptional flow.

Bakersfield, Cal.—H. M. Story, superintendent of the Standard Oil Company's Midway-McKittrick pipe line, stated that the new line would be ready to handle oil by September 1st, though no oil will be sent into the Kern River station until the pumping plant is completed some months hence. No offers of contracts have yet been made to any of the McKittrick producers, however, and as most of the product is already contracted for, it is probable that the oil will not be handled as early as it is anticipated.

Reno, Nev.—Since the discovery of oil at the base of Peavine Mountain, about three miles north of Reno, by the Nevada Oil and Development Company, there has been a great rush to that vicinity to locate claims in the adjoining acreage where the same formation exists. Claim jumpers have been busy and the strike of natural gas in the well of the Nevada Oil and Development Company greatly augmented the rush into the district. As the discovery of this fuel supply is considered a better proposition than a gold mine near Reno, several new wells will be started during the coming week, as the present well flows stronger as depth is attained.

TRANSMISSION.

Reno, Nev.—Henry W. Esden, formerly owner of the Wadsworth Light & Power Co., has organized a company composed of several San Francisco capitalists, and is at present constructing a large power plant on the banks of the Truckee River, about seven miles east of Reno. This plant will be one of the largest on the Truckee River, and besides furnishing power to Olinghuse, Fallon, Fairview and Wonder, will enter into competition with the Reno Power, Light and Water Co., and run lines into this city. This new company will compete with the Fleishackers, and threatens to greatly reduce the price of power in this city.

Napa, Cal.—The presence of a large party of surveyors in this county has revealed an enterprise to supply every farmer in Sonoma, Mendocino, Solano, Lake, and Napa Counties, and every town and village with electricity. The corporation behind the enterprise is the Snow Mountain Water and Power Company, and the source of supply will be the Eel River, in Mendocino County. Gravelly Valley has been converted into an immense reservoir, and a tunnel a mile in length has been dug to divert the water from the Eel River to the reservoir, which will contain water sufficient to generate 33,000 horsepower. Lines have been surveyed through all the surrounding counties, but the main line will pass through Sonoma southward, with Oakland as the objective point. The sub-station in Napa County will be at St. Helena, where 55,000 volts will be received and reduced to 2,200 volts for distribution. The farmers throughout this county are much interested in the proposed work, and are so desirous of having the line here that many already have agreed to utilize the electricity on the farms to pump water and for other purposes. One rancher proposes to plant 500 acres in alfalfa as soon as power is ready for his irrigating pump. The poles for the power lines are on hand, and the officials of the company say that the current will be turned on by December 1st. With the arrival of the new power line there will be sharp competition with the Bay Counties Power Company, which supplies electricity to Napa and surrounding cities.

San Jose, Cal.—The Exploitation Co., known as the National Park Electric Co., in which San Jose capitalists are interested, has completed surveys for power plants and transmission lines to be generated by the waters of the Tuolumne River. Five thousand horsepower will be generated, and before the power plants and transmission lines are completed an expenditure of from $4,000,000 to $5,000,000 will have been made. The company is capitalized for $250,000. The average flow of the Tuolumne River will be sufficient to generate this current, especially as the water will fall 1,400 feet vertically just before it impinges on the water wheels or turbines that will run the generators. By tapping another branch of the Tuolumne, waters will be led to reservoirs high above the main stream and conserved until needed. Six of these auxiliary storage plants will be constructed, and the surveys are already made. One of these reservoirs alone will contain 600,000,000 cubic feet, and with six the dry season can be tided over. A remarkable feature of these reservoirs is that the spillway will be of solid rock. To get the necessary fall in the water a flume line fourteen miles long will be carved on the mountain side ending 1400 feet above the flat on which the generator station will be installed. The generating machinery probably will be put in 10,000 horsepower at a time. Beside the National Park Company, with its 50,000-horsepower output, there are others who are preparing to help obviate this disadvantage of scarcity of coal. One of these companies is the General Electric Power Company, which will utilize the waters of the Clear Lake and generate 50,000 horsepower.

FINANCIAL.

San Francisco.—The United Railroads will pay into the city treasury $25,500 of its gross receipts during 1905. The road and the Finance Committee of the Supervisors arrived at this sum by computing from the payments made during the three preceding years the probable increase for 1905. The United Railroads received in fares $5,489,622 in 1902; $6,189,898 in 1903, and $6,591,843 in 1904. On this basis the probable receipts for 1905 were estimated at $7,000,000. About one-third of the road's mileage has to pay a percentage.

San Rafael, Cal.—The residents of Southern Marin County are greatly interested in the announcement that the Howard-Shafter Water Company has floated a $4,000,000 bond issue in Paris, which will insure water mains being laid in the near future at Corte Madera, Larkspur and other places in that vicinity. The Howard-Shafter Company owns a water shed of more than 15,000 acres, and it is purposed to dam Big Carson Creek, which lies between Geronimo and Camp Taylor, and pump the water over White's Hill to the distributing mains. A portion of the water shed of the Marin County Water Company is owned by the Howard-Shafter people. It is anticipated that material increase in land values will result on completion of the project, as an enormous territory will be supplied with an unlimited quantity of water.

San Francisco.—Colonel Heuer's appraisement of the Spring Valley properties was adopted unanimously by the Executive Committee of the Federated Water Committee, to be suggested as a basis for negotiations for the purchase of the water works by the city. In round numbers, $31,000,000 is the figure arrived at by Colonel Heuer as an equitable valuation of the property in its present condition. This is reduced to nearly $26,000,000 by throwing out $4,0000,000, the accepted value of the Lake Merced lands, and $600,000 for other outside acreage, which it is not thought necessary for the city to purchase. The appraisement is made by taking an average of fourteen valuations of Spring Valley, made at different times. Seven of them were parts of sworn court testimony by different engineers. Four of them are estimates made by the City Engineer for the purpose of fixing the water rate. Another is the par value of the securities; another, the market value of the same, and the last is arrived at by taking an option of $11,000,000, which the city had some years ago, and adding the improvements since that day. In order to compensate for the item of earthquake and fire loss, $880,000 is first subtracted from each of the different estimates made prior to April 18, 1906. No change is made in the market value figure, nor in the one estimate of City Engineer Woodward's, which was made in the current year. It is thought that the Spring Valley bondholders will consent to a sale at this figure, as I. W. Hellman said recently that he considered it one of the fairest appraisements which had been made of the property of the water company. It would result in the bondholders receiving par for their investment, and the stockholders, after the final disposition of the Merced Lake lands, would realize a slight profit above the $50 par value of the stock.

INCORPORATIONS.

The Eldorado Power Co. has been incorporated with a capital stock of $1,000,000, shares $100 each, by P. A. McCarthy, F. H. Curry, A. B. Weiler, R. K. Barrows, and C. H. Patterson. The place of business is San Francisco.

San Luis Obispo, Cal.—Articles of incorporation have been filed by the Hazard Ranch Oil Co., with a capital stock of $500,000, by C. A. Younglove, A. P. Freeman, Mark Elberg, J. M. Feltz, L. A. Enos, and F. A. Hazard, all of San Luis Obispo.

ELECTRIC RAILWAYS.

Stevenson, Wash.—The application of the Stevenson Hot Springs Company for a franchise to lay a pipe line and construct electric railroad was read to the City Council and October 7, 1907, was set for hearing the same.

Aberdeen, Wash.—The Grays Harbor Railway & Light Company has a crew of men busy stringing wires along their intended car line in North Hoquiam and a trolley wire will soon be put in place. As soon as the City Council decides on the improvement of streets, work of laying the rails will be started.

Bellingham, Wash.—S. L. Shuffleton, constructing engineer for Stone & Webster, lately held a conference with C. X. Larrabee and Cyrus Gates, and negotiations for a right of way for the proposed interurban line through land held by the millionaire are proceeding. The interview with Larrabee was satisfactory, and perhaps within a few days negotiations will be brought to a satisfactory conclusion. Larrabee has just arrived from an island near Bellingham where he has been camping.

Billings, Mont.—Notice of a special election, held for the purpose of submitting to the qualified voters the question of granting to Yegen Brothers a franchise for the construction and operation of an electric street railway in the city of Billings, has been issued by the city clerk. The election will be held September 14, and in case the franchise is granted the city is to receive one-half of one per cent of the gross earnings of the company, collected as passenger fares inside the city limits. When those earnings have reached $10,000 per year the amount received by the municipality is to be increased one-fourth of one per cent for each additional increase of $10,000 in the gross earnings of the company until two per cent is reached. It is believed that there will be little or no opposition to the granting of the franchise, which is to extend for thirty years.

Boise, Idaho.—The Boise Railway Company has secured the right of way and had surveys made for extending its system to Barber Dam and also for a line to the top of Table Rock, where it is proposed to build a large hotel. The plan includes a summer resort on this hill which is only a few miles from the city and has an altitude of nine hundred feet higher. Water will be secured in the hills about two and one-half miles above the company's high pressure, the fall being about two hundred feet. The company has gone to a big expense in making the survey. The line will be laid so that all along the route a fine view of the surrounding country can be obtained. J. W. Anderson, president of the company, is in the city on important business for the company and a deal is pending by which the transfer of the Boise Railway lines may be made to the Boise & Interurban. J. J. Fisher of Pittsburg, Howard Butcher, Jr., and J. C. Stephens of Philadelphia, heavy stockholders in the Boise & Interuraban, met with Mr. Anderson and made a trip over the line in the city.

Bellingham Wash.—Before the City Council this week appeared A. A Haug, who will build smelters in the Mount Baker mining district, and declared he would ask the Council next Monday night for a franchise on streets in the city with a view to building an electric railroad from the water front in old town to the mountains. He said that he proposed to start from the water front and follow Whatcom Creek to New Street, thence up that street to Iowa Street, thence to Ellis Street, and up that highway to the city limits. All he wanted of the Council, he asserted, are a few courtesies. He said that if a franchise is granted him he will begin construction not later than February, 1908, and possibly in December of this year. He asked for speedy action as he will leave Bellingham about September 20 for Europe. He promised to present his franchise as he desired it next week and agreed to furnish copies to the councilmen early this week, possibly today. Regarding the forest reserve district, he said he would have to get a bill passed by Congress authorizing him to build through the reserve. He told Cloak that his road would be operated both for freight and passenger business.

TRANSPORTATION.

Redlands.—Ground has been broken for tracks of the new street railway at Redlands, by the Redlands Central road. Work will be pushed through to an early completion. J. H. Fisher is general manager. The road will extend from the eastern city limits through to the western city limits.

Hanford, Cal.—S. J. White came before the Board of Trustees at its last meeting and stated that he came at the request of F. A. Granger of Denver, who wished to make application for a franchise for the construction of a street railway in Hanford. The matter was discussed and it was decided that Mr. Granger be invited to come here and meet with the Board to consider the proposition.

San Diego, Cal.—The first contract for the actual grading of the San Diego & Arizona Railroad from this city and bay to the Imperial Valley, Yuma and beyond was let Tuesday to Rendall, Frazier & Co., local contractors. Work will begin immediately. John D. Spreckels, president of the road, says that just as fast as the remainder of the right of way can be cleared for action additional contracts will be let and the work rushed.

San Francisco, Cal.—A number of residents of the Sunset district have appeared before the supervisors' utilities committee to urge that a franchise for a street railroad in Nineteenth Avenue and other streets in the Parkside district be granted to the Parkside Transit Company. C. W. Riffe, president of the Sunset Improvement Club; R. P. Schwerin, president of the Automobile Club, and other interested property owners strongly favored the granting of the franchise. The committee agreed to inspect the proposed route of the road next week.

Martinez, Cal.—A project that is being financed by A. W. Maltby met with considerable encouragement when the Board of Supervisors granted Mr. Maltby permission to cross the county roads with an electric car line. Mr. Maltby appeared before the Board some time ago and asked for permission to cross the county roads with an electric line between Lafayette and Antioch, and also to pass through the inter-county tunnel. The Board took the matter under consideration, and when Mr. Maltby appeared later stated that permission would be granted to cross the roads, but the passageway through the tunnel would not be given until the project had taken more definite shape.

Berkeley, Cal.—Preparations are being made by engineers of the People's Water Company for the construction of the tunnel under the foothills for nearly a mile and a half to carry water from the San Pablo Creek reservoirs to Oakland and Berkeley. Six large 125-horsepower boilers have arrived and have been placed on the future site for the pumping plant. At the station homes for the superintendent and the workmen have already been constructed. Teams and a large force of workmen will start work shortly on the long tunnel under the hills. The tunnel is to be 5x9 feet and will carry a large volume of water when completed. The compressed air and electric systems will be used in tunneling. Water will be furnished to Berkeley and Oakland and possibly to the city of Alameda. The tunnel will not be completed for several months.

POWER AND LIGHT.

Albany, Ore.—The City Council has passed the ordinance granting to Jas. Steel and his associates a franchise to erect and operate a gas plant in this city for lighting and heating purposes.

St. Johns, Ore.—An application of the Portland Gas Company for a perpetual franchise was rejected by the City Council. The Franchise asked by Dairdorf for gas will be granted at the next meeting.

Waitsburg, Wash.—Roberts & Henderson, proprietors of the electric light system of this city, have been placing a large gasoline engine outside of their power house. They will arrange to attach this engine to the present dynamo. This engine was installed on account of the water getting so low in the Touchett that it was impossible to supply the city with lights.

Lewiston, Idaho.—The North Lewiston Water Company has been incorporated by J. L. Chapman, Albert Davis, Chas. Mix, W. A. Morey, R. R. Lowe, Austin Morey and Wallace Stainton, all of Lewiston. The company owns springs and 320 acres of land near the city and plans to convey the water to the lands which are adapted to grape culture. Present capacity of the springs is 250,000 gallons per twenty-four hours.

Twisp, Wash.—There is on foot a project to dam the river at this point, which competent engineers have declared is ideal for the purpose, and generate power by the installation of a power plant, to furnish the town Twisp with power and electric lights. Measurements are being made to determine the number of horsepower that can be generated and when all investigations are complete, if satisfactory, an effort wil be made to interest some outside capital.

Corvallis, Ore.—The City Council has just passed the gas franchise asked for recently by James Steel, of Salem, giving him the right to manufacture gas in Corvallis for twenty-five years. Work will begin on the construction of the plant within two weeks and the factory will be located on the bank of the Willamette. The building is to be 40x70 feet, two stories high, and the entire plant will cost about $20,000. The distributing system will require about ten miles of pipe, and Mr. Steel thinks that he will have about six miles laid and ready for use before the rainy season is on. It is thought the chance to use gas will cause a drop in the price of wood, which is up to $4.50 per cord now.

Fairview, Ore.—Fairview, Multnomah County, is becoming a railroad center. The Mason Construction Company has established its headquarters there and is making preparations to start grading the right of way for the Mount Hood Railway & Power Company. The company has a big outfit of 120 men, teams, and construction materials assembled there, but the point at which work will be commenced is carefully concealed. A large amount of machinery has been taken to the site of the power plant to be erected on the Sandy River. A force of workmen is blasting out the foundations for the plant and work is going ahead well. The plant is to be located on the west bank of the Sandy River and another camp of men is located on the east side of the river.

INCORPORATIONS.

Redding, Cal.—Articles of incorporation have been filed by the Noble Electric Steel Company with a capital stock of $1,000,000. The directors and officers are: H. H. Noble, president; E. V. D. Johnson, vice-president; C. B. Morgan, secretary.

San Bernardino.—The San Gorgonio Water Company has been incorporated with a capital stock of $50,000 by C. W. Gates, M. W. Stephens, and R. W. Stephens, all of Los Angeles. The Beaumont Land and Water Company has also been incorporated by the same directors with a capital stock of $200,000.

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